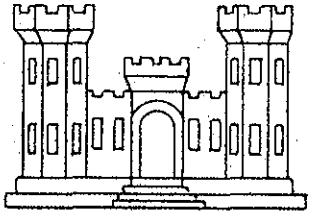
~~CONFIDENTIAL~~

GLOUCESTER HARBOR

AND

ANNISQUAM RIVER

MASSACHUSETTS



AUTHORITY,-THIS REPORT IS SUBMITTED IN COMPLIANCE WITH RESOLUTION ADOPTED OCTOBER 8, 1938 , BY THE COMMITTEE ON RIVERS AND HARBORS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES CONGRESS.

U.S.ENGINEER OFFICE
BOSTON MASS.
AUGUST 5, 1940.

COPY NO.16

U. S. ENGINEER OFFICE
BOSTON, MASS.

Date Recd.	Date Fwd.	Init.
8/20		W
9/3	V	
9/3	-	
9/3	V	
8/19		

111
317 Glen.

To
- District Engineer
- Miss Andrews
- ADMINISTRATIVE DIVISION
- Chief Clerk
- Asst. Chief Clerk
- Mrs. Hern
- Mail & Records Section
- Correspondence Section
- Personnel Section
- Finance Section
- Purchase Section
- Property Section
- ENGINEERING DIVISION
- Major Gullatt
- Mr. Corry
- Special Studies Section
- Land Acquisition Section
- FLOOD CONTROL SUBDIVISION
- Mr. Allen
- Reports Section
- Mr. Ganick
- Hydraulics & Hydrology
- Design Section
- RIVER & HARBOR SUBDIVISION
- Mr. Murphy
- Spec. & Estimates Section
- Reports Section
- Permits Section
- Structures & RR Bridge Sec.
- Drafting & Reprod. Section
- Statistics & Library Sec.
- OPERATIONS DIVISION
- Major White
- Contracts Section
- Reports & Estimates Sec.
- Cost Section
- Safety Section
- Photographic Section
- Plant Section
- FIELD AREA NO. 1
- Major White
- Mr. Chapin
- Mr. Gamble

For
- Approval
- Attention
- Checking
- Comment
- Copies
- Discussion
- Estimate
- File
- Information
- Initial
- Instructions
- Mailing
- Mimeographing
- Necessary Action
- Note
- Prepare Reply
- Previous Papers
- Recommendation
- Signature
- Suspend ____ Days
- Typing

REMARKS: _____

_____ (Initials)

D.O. Form 49 (Revised 7/16/40)

PUBLIC NOTICE RELATIVE TO PROPOSED IMPROVEMENT OF
GLOUCESTER HARBOR AND ANNISQUAM RIVER, MASSACHUSETTS.

WAR DEPARTMENT
OFFICE OF DIVISION ENGINEER
NORTH ATLANTIC DIVISION
Room 1213, Federal Office Building, 90 Church St.
NEW YORK, N. Y.

Gloucester Hbr. 1/21.11c

August 15, 1940

TO WHOM IT MAY CONCERN:

1. It has come to the notice of the undersigned that you have expressed an interest in the pending proposition for the improvement of Gloucester Harbor and Annisquam River, Massachusetts. You are hereby informed that the survey report thereon, authorized by a resolution, adopted October 8, 1938, by the Committee on Rivers and Harbors, House of Representatives, has been made and is partially favorable to the improvement desired in that it recommends modification of the existing Federal project to provide for dredging, to a depth of 8 feet deep at mean low water, an anchorage area of about 17 acres at the entrance to Lobster Cove, provided that local interests agree: to contribute one-third the cost but not to exceed $25,000; to furnish disposal areas; and to release the United States from damage claims. The principal reasons for recommending only a partial improvement are that the requested anchorage in Stage Cove, the removal of ledges in Gloucester Harbor, and the enlargement of the entire waterway to provide a channel 12 feet deep and 200 feet wide, are not economically justified at the present time, and the desired easing of the bends can be accomplished by maintenance work under the authorized project.

2. You are further notified that all interested parties have the privilege of an appeal from this conclusion to the Board of Engineers for Rivers and Harbors, a permanent body sitting at Washington, D. C., to which all examination and survey reports of this character are referred. Parties desiring to do so may be heard on appeal by the Board, either orally or in writing. Written communications should be addressed to the Board of Engineers for Rivers and Harbors, Munitions Building, Washington, D. C., and should be mailed in time to be in the possession of the said Board within four weeks from the date of this communication. If, however, you have important data to communicate to the Board, which cannot be collected and put in shape for proper presentation within four weeks, the Board should be informed of this fact without delay and request made for an extension of the limiting date for submitting information. If oral hearings are desired, dates for the same may be arranged for by correspondence with the Board.

3. Any further information needed may be obtained by application to the Division Engineer, or to the District Engineer, United States Engineer Office, 3d Floor, Park Square Building, 31 St. James Avenue, Boston, Massachusetts, but attention is invited to the following regulation as to the manner in which such information may be furnished:

"Where interested parties desire data necessary for the preparation of their appeal to the Board of Engineers for Rivers and Harbors, they will be afforded full opportunity to examine the copies of the reports of the District and Division Engineers in their respective offices, subject to the understanding that no part of the contents of these reports will be published in the newspapers or otherwise until the reports have been submitted to Congress. Copies of the reports will not be furnished or loaned for use outside of the office, but interested parties will be permitted to make such notes of the contents as they desire.

4. You are requested to communicate the foregoing to any persons known to you to be interested in the improvement and who, not being known to this office, do not receive a copy of this communication.

J. N. HODGES,
Colonel, Corps of Engineers,
Division Engineer

SURVEY (REVIEW OF REPORTS) OF GLOUCESTER HARBOR AND ANNISQUAM RIVER, MASSACHUSETTS

Syllabus

The district engineer is of the opinion that relief from existing congestion in Annisquam River, Massachusetts, is of sufficient importance to general navigation to justify Federal participation in providing additional anchorage facilities. He recommends modification of the existing project for Annisquam River to provide for a dredged anchorage area of about 17 acres at the entrance to Lobster Cove, 8 feet deep at mean low water, at an estimated cost of $69,300 for new work and $2,200 annually for maintenance, provided local interests will contribute one-third of the cost of the project, but not in excess of $25,000, and comply with the other provisions of local cooperation outlined in paragraph 41 "Recommendation".

War Department
United States Engineer Office
Boston, Massachusetts
August 5, 1940

Subject: Survey (Review of Reports) of Gloucester Harbor and Annisquam River, Mass.

To: The Chief of Engineers, U. S. Army, Through the Division Engineer, North Atlantic Division.

1. Authority. - This report is submitted in compliance with the following resolution, adopted October 8, 1938, by the Committee on Rivers and Harbors, House of Representatives, United States Congress:

> RESOLVED BY THE COMMITTEE ON RIVERS AND HARBORS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby, requested to review the reports on Gloucester Harbor and Annisquam River, Massachusetts, submitted in Rivers and Harbors Committee Document Numbered 39, Seventy-second Congress, first session, with a view to determining whether it is advisable to modify the existing project in any way at this time.

2. In accordance with the above authority, a preliminary examination report was submitted by the district engineer under date of December 11, 1939, recommending a survey of Annisquam River in the vicinity of Lobster Cove.

The division engineer, agreeing in general with the views of the district engineer, recommended that the survey cover the entire length of the Annisquam River and Blynman Canal from Gloucester Harbor to deep water in Ipswich Bay. The Board of Engineers for Rivers and Harbors concurred in the recommendation of the division engineer, and the Chief of Engineers, under date of February 5, 1940, authorized the survey as recommended by the Board.

3. Reports under review. - The reports under review were submitted in Rivers and Harbors Committee Doc. No. 39, 72d Congress, 1st session, in compliance with 2 authorizations: (a) a resolution adopted February 27, 1929, by the Committee on Rivers and Harbors, House of Representatives, United States Congress, requesting review of the report on Gloucester Harbor, Mass., submitted in House Doc. No. 1112, 60th Congress, 2d session; and (b) the River and Harbor Act approved July 3, 1930, authorizing preliminary examination and survey of Gloucester Harbor and Annisquam River, Massachusetts. The improvements considered in the reports under review consisted of the removal of about a dozen ledges in the inner and outer harbors at Gloucester and the proposal "that the Federal Government take over the Annisquam River as part of the Intercoastal Waterways system and provide for its future maintenance and development".

4. In his report dated June 28, 1932, the Chief of Engineers recommended that no further improvement of Gloucester Harbor be undertaken by the Federal Government at that time. He reported, however, that the United States was fully warranted in taking over and extending the Annisquam River project, and recommended improvement of that waterway "to provide a channel 8 feet deep at mean low water, 60 feet wide from Gloucester Harbor to the Boston & Maine Railroad Bridge, 100 feet wide from the railroad bridge to the mouth of the river, and 200 feet wide across the bar in Ipswich Bay, including the removal of a ledge near the Gloucester Harbor entrance, at a total estimated cost of $32,500, with maintenance estimated at the rate of $3,500 annually". In this form the project was adopted by Congress in the River and Harbor Act approved August 30, 1935.

5. Description. - Gloucester Harbor lies on the south side of Cape Ann on the north shore of Massachusetts Bay, about 23 miles by water northeast of Boston Harbor. The harbor consists of a natural indentation in the coast line with its long axis in a northeast-southwest position. At the entrance, a stone breakwater 2,250 feet long projects from Eastern Point, reducing the natural width at the entrance to about 4,000 feet. Within the axis of the breakwater, the area below high water is about 1,520 acres, of which 175 acres at the northeast end constitutes the inner harbor, where the principal waterfront facilities are located. An area of about 80 acres in the inner harbor affords depths at mean low water of 12 feet or more, while the outer harbor provides depths of 18 feet or greater over an area of nearly 1,000 acres. The maximum length of the harbor, from the axis of the breakwater to the head of the inner harbor, is about 2.3 miles. Gloucester Harbor affords excellent shelter from all storms except those approaching from the south or southwest. The mean and spring ranges of tide in the harbor are 8.7 feet and 10.1 feet, respectively.

6. Annisquam River is a tidal waterway extending from Gloucester Harbor to Ipswich Bay, a distance of approximately 4 miles. A reach of the waterway about 1,800 feet long, at the harbor end, is known as the Blynman Canal. In its original condition, depths in the Annisquam River did not exceed about 6 feet at mean low water, and from the Boston & Maine Railroad Bridge to the harbor the stream consisted of little more than a drainage ditch with a bottom elevation of 0 to 2 feet above mean low water. Improvements by the Commonwealth of Massachusetts beginning in 1903, and by the Federal Government beginning in 1936, have provided a depth of 8 feet in the entire waterway, and widths ranging from 60 to 200 feet. At Annisquam, near the mouth of the river, the mean and spring rangesof tide are 8.5 feet and 9.9 feet, respectively.

7. The locality is shown on United States Coast and Geodetic Survey Charts Nos. 233 and 243, and on the map accompanying this report. The improvements under consideration at the present time are not expected to result

in any significant shore line changes nor will they involve any questions of water power, flood control or other special subjects. Aside from the preliminary examination report to which reference is made in paragraph 2, no report on Gloucester Harbor and Annisquam River has been made within the past five years.

8. Tributary area. - The city of Gloucester constitutes the principal commercial area tributary to the harbor. Its leading activities are fishing and related industries, and manufacturing. Although Essex County, in which Gloucester is located, showed an increase in population of about 32 percent in the 30-year period 1905-1935, Gloucester and the neighboring towns of Essex and Rockport experienced decreases of about 7, 17 and 18 percent, respectively, in the same period. The populations of these three communities in 1935 were: Gloucester, 24,164; Rockport, 3,634; and Essex, 1,486. As of January 1, 1938, the total values of assessed real estate were $34,790,235, $5,226,450, and $1,523,380, respectively.

9. In addition to the commercial activity in Gloucester, the entire Cape Ann area constitutes a well-established recreational area. Each season the normal population of the area is greatly augmented by summer residents attracted by the facilities for water sports, the natural beauty and the comfortable climate which are afforded in this locality. Tuna fishing in Ipswich Bay is one of the features which is growing in importance as an attraction to sport-fishing enthusiasts. To the permanent residents of Cape Ann, the recreational trade forms one of its leading sources of income. The locality is served by the Eastern Division of the Boston & Maine Railroad and by a network of improved roads and highways.

10. Bridges. - No bridges cross Gloucester Harbor, but the Annisquam waterway is crossed by one highway and one railroad bridge authorized by state law April 4, 1905, and March 26, 1845, respectively. The highway bridge, which is owned by Essex County, crosses the Blynman Canal at a point not more than 200 feet from the Gloucester Harbor end of the waterway. This

structure includes a double-leaf bascule span which provides a navigable horizontal clearance of 40 feet and vertical clearances of 16.4 feet at mean low water and 7.5 feet at high water. Plans for this structure were approved by the War Department August 12, 1913, and construction was completed in October, 1913. The railroad bridge, owned by the Boston & Maine Railroad, crosses Annisquam River about 4,000 feet from Gloucester Harbor. This bridge includes a single-leaf bascule span which provides a horizontal clearance of 40 feet and vertical clearances of 25.5 feet at mean low water and 16.6 feet at high water.

11. Existing project. - The existing project for Gloucester Harbor and Annisquam River was adopted by the River and Harbor Act of August 11, 1888, supplemented by enactments from 1894 to 1935. It provides for dredging to a depth of 15 feet at mean low water along the main waterfront in the inner harbor; dredging of Harbor Cove to a depth of 10 feet; the removal of 3 ledges in the inner harbor and 5 ledges in the outer harbor to depths of 12 to 25 feet; a stone breakwater 2,250 feet long extending from Eastern Point to Oat Ledge at the entrance to the outer harbor; and the improvement of Annisquam River to provide a channel 8 feet deep, 60 feet wide from Gloucester Harbor to the Boston & Maine Railroad Bridge; thence 100 feet wide to the river mouth; thence 200 feet wide across the bar in Ipswich Bay; and the removal of a ledge at the Gloucester Harbor end of the waterway.

12. The existing project was completed in November, 1936, and repairs to the breakwater were completed in July, 1939. To June 30, 1939, total costs under the existing project have been $534,100.20, including $501,178.84 and $33,975.89 for new work in Gloucester Harbor and Annisquam River, respectively, and $48,945.47 for maintenance in Gloucester Harbor. Controlling depths at mean low water are 18 to 25 feet over the ledges in the outer harbor, 14.6 feet over the ledges in the inner harbor, and 8 feet in Annisquam River. There have been no prescribed conditions of local cooperation in the Federal improvement of these waterways.

13. Other improvements. - The Commonwealth of Massachusetts, in cooperation with the City of Gloucester, has carried out the following improvements in Gloucester Harbor and Annisquam River:

Locality	Improvement	Expenditure
Gloucester Harbor (1915-1933)	Dredged channels 12, 16, and 17 feet deep at m.l.w.; removal of 3 ledges in harbor to depth of 16 feet at m.l.w.; construction of seawall along the Western Ave. shore just easterly of entrance to the Blynman Canal.	$208,802.79
Harbor Cove (1912-1937)	Deepening, by dredging and ledge removal, to 15 feet at m.l.w. over the entire area of 50 feet outside the wharf lines; dredged channel and basin 130 feet long, 30 feet wide, and 6 feet deep at m.l.w. from the 6-foot contour at the northwesterly end of cove to public landing at its head; dredged area at town landing 6 feet deep at m.l.w.	25,762.82
Smith Cove (1914-1936)	Dredging in 3 areas to depths of 6, 10, and 14 feet at m.l.w.	52,752.34
Fresh Water Cove (1921-1922)	Dredged channel and basin 6 feet deep at m.l.w.	17,477.53
Annisquam River (1906-1929)	Dredging and ledge removal to a depth of 8 feet at m.l.w.; riprapping banks of Blynman Canal.	171,498.69
Lobster Cove (1909-1937)	Dredged channel 6 feet deep and anchorage basins 6 and 8 feet deep at m.l.w.	66,603.36
Mill River (1912-1915)	Dredged channel 6 feet deep at m.l.w.	24,899.59
	Total	$567,797.12

14. Terminal and transfer facilities. - Virtually the entire waterfront development at Gloucester lies in the inner harbor where there are 77 piers and wharves, devoted principally to the receipt and handling of fish and fish products, and to servicing the vessels of the fishing fleet. The majority of the wharves are of wood pile and timber deck construction, extending outward from earth-filled masonry bulkheads. Two wharves are owned by the City of Gloucester and are open to the public. The remaining wharves are privately

owned, with the exception of the State Fish Pier, which was completed in 1938 by the Commonwealth of Massachusetts at a cost of approximately $1,174,000, including a P.W.A. grant of $522,000. The Fish Pier is leased by the Commonwealth to the City of Gloucester, operating as a public municipal corporation. None of the piers in Gloucester Harbor has direct rail connections.

15. There are 2 commercial wharves on Annisquam River, both used in connection with receipt and storage of petroleum products. One of these is immediately south of the railroad bridge and the other is just north of the bridge. Facilities for pleasure craft include the landing of the Annisquam Yacht Club and several small private landings along the river and in Lobster Cove.

16. Improvement desired. - In order to afford local interests an opportunity to express their views relative to improvement of Gloucester Harbor and Annisquam River, a public hearing was held at Gloucester on January 20, 1939. The hearing was attended by national and state legislators, representatives of the Massachusetts Department of Public Works and the City of Gloucester, representatives of civic and trade groups in Gloucester and neighboring communities, shipping and commercial fishing interests and organizations and individuals concerned with the recreational features of the waterways under study. A complete record of the hearing was submitted with the preliminary examination report of the district engineer dated December 11, 1939.

17. The improvement most strongly advocated at the hearing consists of dredging 2 basins, one in Stage Cove and the other at the entrance to Lobster Cove, to provide an aggregate anchorage area of about 32 acres having a depth of 8 feet at mean low water. Other improvements suggested at the hearing included the enlargement of the entire Annisquam waterway to provide a channel 12 feet deep and 200 feet wide; the easing of two bends in the present river channel; and the removal of certain ledge areas in Gloucester Harbor.

18. Data presented at the hearing indicate that in 1938 the number of vessels passing through the Annisquam waterway and requiring opening of the bridges was 7,004, and it was estimated that an equal number, not requiring bridge openings, also passed through, so that the total number of vessel trips was about 14,000. The majority of these boats are local and transient pleasure craft, but the number also includes a great many small commercial vessels, principally fishing boats, whose operators make use of the sheltered waterway in traveling between Gloucester and the fishing grounds in order to avoid the longer and more exposed route around Cape Ann. The only off-channel anchorage available in the river is Lobster Cove, which is so limited in depth and area, according to local interests, that if occupied by 4 or 5 boats 50 feet in length, its use by additional vessels is practically impossible. As a result of this condition, vessels in large numbers anchor along the edge of the channel, in which position they may swing out into the channel where they create a serious collision hazard, endangering the boats proceeding along the river as well as the anchored vessels themselves.

19. Local interests believe that the requested anchorage areas would relieve present congestion, eliminate the serious collision hazards and form an excellent harbor of refuge. They believe that the improvement would encourage greater use of the waterway by pleasure craft, resulting in substantial benefits to the local establishments engaged in furnishing supplies and services to the yachting trade. The easing of bends and other improvements to the river channel, and the removal of ledges in Gloucester Harbor, it was maintained, would further eliminate the difficulties and dangers now involved in navigating these waterways.

20. A representative of the Massachusetts Department of Public Works indicated that his department would be willing to ask the State legislature for funds to meet the requirements of local cooperation which might be imposed in connection with a Federal improvement, provided the City of Gloucester would agree to contribute toward the Commonwealth's share of the expense. Local interests stated that suitable disposal areas adjacent to the

proposed anchorage basins would be made available to the Federal Government without charge.

21. Commerce. - The following table gives a comparative statement of traffic in Gloucester Harbor and Annisquam River for the 10-year period 1930-1939. The principal products handled in Gloucester Harbor are fish, coal, petroleum products, salt and lumber. The entire tonnage received in Annisquam River in 1939 consisted of petroleum products.

Comparative Statement of Traffic - 1930-1939

Year	Gloucester Harbor		Annisquam R. and Blynman Canal	
	Tons	Value	Tons	Value
1930	78,795	$1,786,062	10,366	$ 218,718
1931	60,321	1,156,616	8,102	147,646
1932	48,566	840,229	6,174	110,961
1933	42,566	972,329	6,900	125,884
1934	53,051	853,654	3,486	49,015
1935	57,979	1,827,855	6,750	113,133
1936	64,609	3,834,667	8,103	134,639
1937	64,276	1,442,637	8,682	173,157
1938	70,760	1,527,365	9,267	159,670
1939	81,948	-	7,387	-

22. Vessel traffic. - Complete records of drafts and tonnages of vessels using Gloucester Harbor are not available. The majority of vessels using the harbor are those in the fishing fleet, consisting of sailing, steam and motor vessels having average and maximum drafts of about 13 feet and 18-1/2 feet, respectively, and an average gross tonnage of about 110 tons. Coal and oil are received at Gloucester in towed barges drawing 10 to 19 feet. Arrivals in 1939 included 1 steamer, 22 barges and 97 sailing vessels. One steamer, 3 sailing vessels and 59 motor vessels were engaged in foreign trade. Fish was delivered in about 6,000 trips of small motor boats.

23. Traffic on the Annisquam River consists principally of recreational craft, fishing vessels which draw 3 to 12 feet loaded, and oil barges towed to the oil terminal on Annisquam River by tugs drawing 12 to 14 feet. The following table, showing the number of craft passing through Annisquam River and Blynman Canal, includes only those vessels which required opening of the drawbridges. It is estimated that an equal number, not requiring opening of

the draws, also passed through the waterway.

Vessel Traffic in Annisquam River and Blynman Canal

Year	Steamers	Sail	Motorboats	In Tow	Total
1930	76	17	5,049	231	5,373
1931	62	21	5,504	183	5,770
1932	34	45	6,063	84	6,226
1933	28	26	7,463	130	7,647
1934	30	22	7,320	108	7,480
1935	42	33	6,790	126	6,991
1936	460*	44	6,581	338*	7,423
1937	1,064*	43	6,144	882*	8,133
1938	62	26	6,743	173	7,004
1939	51	30	6,463	143	6,687

*Abnormal increase accounted for by movement of tugs and scows hauling sand fill to site of new fish pier in Gloucester Harbor.

24. Difficulties attending navigation. - According to local interests, the principal difficulties with which navigation in Annisquam River must contend are the lack of suitable anchorage facilities and the collision hazard created by moored vessels which are forced to anchor in or near the river channel. Other difficulties include the unsatisfactory navigating conditions caused by 2 sharp bends in the present channel and by insufficient depth in the channel across the bar leading to Ipswich Bay. Certain ledges in the inner harbor at Gloucester are considered by local interests to be hazardous to vessels of deep draft.

25. Survey. - A survey of Annisquam River from Gloucester Harbor to Ipswich Bay, including the area in the vicinity of Lobster Cove, was completed in April, 1940. The results of this survey, which included triangulation, topography, soundings, probings, and tidal observations, are shown on the accompanying map entitled, "Gloucester Harbor and Annisquam River, Massachusetts," Scale 1:2000, File No. 178, Dr. 37.

26. Plan of improvement. - Two plans of improvement have been considered in the present report and are indicated on the accompanying map. Plan "A" consists of the following items:

a. A dredged anchorage basin at the entrance to Lobster Cove,

extending from the 8-foot contour in Annisquam River to a point about 1,000 feet below the wooden bridge over Lobster Cove, 8 feet deep at mean low water and having an area of about 17.3 acres.

b. A dredged anchorage basin in Stage Cove, northwest of the Annisquam Yacht Club, 8 feet deep at mean low water and having an area of about 2.6 acres.

Plan "B" consists only of the dredged anchorage basin at the entrance to Lobster Cove, described in paragraph 26a, above.

27. The estimated quantities of dredging involved in each of the 2 plans have been based on place measurement, side slopes of 1 on 3, and an overdepth allowance of 1 foot. The unit costs shown are based on the assumption that the work would be done by a hydraulic dredge, and include an allowance for engineering and contingencies. The estimated quantities and costs are as follows:

Estimated Quantities and Costs

Plan "A"	
Dredging 261,900 cu. yds. @ 32¢ per cu. yd.	$83,800
Estimated annual maintenance cost	2,700
Plan "B"	
Dredging 216,600 cu. yds. @ 32¢ per cu. yd.	$69,300
Estimated annual maintenance cost	2,200

28. Analysis of economic justification. - The economic cost of the project, expressed as an annual carrying charge and based on an assumed life of 40 years, is given below:

a. Federal investment	Plan "A"	Plan "B"
(1) Estimated cost of new work	$83,800	$69,300
(2) Less funds to be contributed	27,900	23,100
(3) Total Federal investment	55,900	46,200

		Plan "A"	Plan "B"
b.	Federal annual carrying charges		
	(1) Interest at 3-1/2% on item a (3)	1,956	1,617
	(2) Amortization of item a (3) (40 years at 3-1/2%)	661	547
	(3) Increased cost of maintenance	2,700	2,200
	(4) Total Federal annual carrying charges	5,317	4,364
c.	Non-Federal investment		
	(1) Funds to be contributed	27,900	23,100
	(2) Total Non-Federal investment	27,900	23,100
d.	Non-Federal annual carrying charges		
	(1) Interest at 4-1/2% on item c (2)	1,256	1,040
	(2) Amortization of item c (2) (40 years at 4-1/2%)	261	216
	(3) Total Non-Federal annual carrying charges	1,517	1,256
e.	Total annual carrying charges		
	(1) Federal annual carrying charges	5,317	4,364
	(2) Non-Federal annual carrying charges	1,517	1,256
	(3) Total annual carrying charges	$ 6,834	$ 5,620

29. The chief benefits to be expected from the improvement of Annisquam River are increased safety and convenience to recreational and commercial navigation, expansion of yachting activity and the commercial activity associated therewith, and provision of a desirable harbor of refuge for transient vessels. While it is impossible to set down the probable value of these benefits in definite monetary terms, it is believed that they will be of sufficient importance to warrant adoption of Plan "B" with local contributions in the amount recommended herein.

30. Discussion and conclusion. - Improvements suggested at the public hearing included four items:

a. The removal of certain ledges in Gloucester Harbor,

b. The enlargement of the entire Annisquam waterway to provide a channel 200 feet wide and 12 feet deep.

c. The easing of 2 bends in the present channel in Annisquam River and enlargement of the channel through the bar at the Ipswich Bay entrance, and

d. The provision of additional anchorage space in the vicinity of Lobster Cove.

31. The first 2 of these items were suggested in a few of the oral statements made at the hearing but they were apparently presented as improvements which may eventually be highly desirable, rather than features for which there is an immediate and pressing need. It is significant to note that representatives of the fishing fleet, the local pilots and the recreational boating interests failed to make any statement in support of these improvements. In general, data presented at the hearing not only failed to establish the need for these improvements, but also lacked evidence of any concerted desire for their adoption. It is believed, therefore, that the first 2 items listed above do not warrant further consideration at the present time.

32. The third item listed above is essentially concerned with maintenance of the existing project for Annisquam River. Channel conditions throughout the waterway were carefully examined following completion of the survey described in paragraph 25, above. Plans for maintenance dredging have been prepared and work will be undertaken during the summer of 1940. Completion of this maintenance work will restore full project dimensions in the channel across the bar, ease the bends which at present cause some difficulty to navigation, and provide a widened area north of the railroad bridge which will facilitate turning of the sizable craft which dock at the oil terminals on the waterway.

33. The fourth item listed above, that of increased anchorage space in the vicinity of Lobster Cove, constitutes the improvement principally desired by local interests and the only item with which the present report is

concerned. The present congestion in Annisquam River, which local interests ascribe to lack of anchorage space, warrants careful consideration of remedial measures to insure the safety and convenience of fishing vessels and small commercial craft, as well as local and transient recreational boats.

34. The Annisquam waterway affords a sheltered cut-off for vessels plying between the North Shore of Massachusetts Bay and Ipswich Bay and points north. Vessels using this waterway between the inner harbor at Gloucester and Ipswich Bay not only avoid the rough seas often encountered in the exposed route around Cape Ann, but also travel less than one-third the distance involved in the outer course. These advantages have made the Annisquam River popular with small commercial vessels, fishing craft and recreational boats, transient as well as local. In recent years annual traffic through the Annisquam River has ranged around 15,000 vessel trips, approximately one-half of the vessels involved being of such size as to require opening of the bridges across the waterway. About 75 percent of this travel occurs in the period May to September and the heaviest traffic takes place during the height of the yachting season in July and August.

35. According to statements made at the hearing, more than 135 locally owned pleasure boats are based in Annisquam River, including 78 vessels connected with the Annisquam Yacht Club. These pleasure boats range from 15 to 75 feet in length and from 2 to 8 feet in draft. In addition to these, about 15 fishing vessels make their headquarters in this area. The only off-channel area available for anchorage of these vessels lies in Lobster Cove where depths of 6 to 9 feet are available over an elongated area of about 7 or 8 acres. This space is intensively utilized by local craft, but with the customary random spacing of anchored vessels, its capacity is sufficient for only a portion of the local fleet. The remaining local and transient craft must seek anchorage in the channel of the Annisquam River itself.

36. In the vicinity of the Annisquam Yacht Club and the entrance to Lobster Cove, the existing channel in the river is comparatively broad, affording widths of 250 to 400 feet between the 8-foot depth contours. The

project width in this vicinity is 100 feet and if a strip of this width along one edge of the existing wide channel were carefully marked and strictly reserved for through navigation, the remainder of the channel could safely be used as a convenient anchorage, particularly for transient vessels. Actually these side channel areas are habitually used for anchoring at the present time, but with little regard for the maintenance of a clear passage for vessels passing through the waterway. According to local interests, vessels anchored in this locality frequently swing out into the fairway, not only endangering themselves, but also creating a serious collision hazard to vessels under way. Fishing vessels bound from Gloucester to the fishing grounds frequently pass through in the hours before dawn and the darkness materially increases the danger of collision.

37. To eliminate these conditions, as well as to permit expansion of pleasure boat activity in this area and enhance its value as a harbor of refuge, local interests suggest that 2 anchorage areas be dredged to a depth of 8 feet at mean low water by the Federal Government, one in Stage Cove and one at the entrance to Lobster Cove. Plan "A" would provide these 2 areas substantially as desired by local interests, and would afford an 8-foot depth over an area aggregating about 20 acres, located entirely outside the present 8-foot depth contour in Annisquam River.

38. In Stage Cove the area suitable for development as anchorage space at reasonable cost is limited to an area of about 2-1/2 acres by the presence of ledge. The desired basin at the entrance to Lobster Cove would make a substantial addition to the usable anchorage space and would be the more important item in Plan "A" for the alleviation of present congestion. It will be noted that provision of this basin would require the removal of a broad shoal area which at present is 2 to 4 feet above mean low water. The heavy cut in this area involves a volume of dredging which is large in relation to the amount of anchorage space created. The formation of this shoal has no doubt been effected by the action of tides and currents which will

continue to act after any dredging has been completed. It is believed likely that a dredged basin at this location would continue to be affected by this shoaling process, and that maintenance of an 8-foot depth may be a comparatively expensive item.

39. Plan "B", which is presented as the most suitable program of dredging, differs from Plan "A" only in omitting the suggested basin in Stage Cove. If ledge removal is to be avoided, an area of less than 3 acres can be dredged to 8 feet in Stage Cove and, since this small area would not provide space for any considerable number of boats, its dredging does not appear to be advisable. Plan "B" would provide a gross area of slightly over 17 acres with a depth of 8 feet at mean low water. About 6 acres of this area already afford depths of 6 to 8 feet, which depths are ample for the majority of local boats. The net increase in anchorage area resulting from Plan "B" would, therefore, amount to about 11 acres. Assuming the use of systematically spaced moorings and allowing a full swinging circle for each boat, this area would have a capacity of about 40 vessels, 30 feet in overall length. This added capacity, it is believed, will appreciably reduce the present congestion and make possible some expansion in the use of this area by pleasure craft and other small vessels. A considerable proportion of the benefits expected to result from this improvement will be local in character, and hence it is believed that local interests should be required to contribute approximately one-third the cost of the project.

40. Increased use of the Annisquam River by yachts, fishing vessels, and other craft, combined with limited anchorage facilities, has resulted in serious congestion in the waterway. A further gradual increase in recreational boating in this area is likely to occur and the collision hazard may be expected to increase correspondingly. The district engineer is of the opinion that correction of existing conditions is of sufficient importance to general navigation to justify Federal participation in providing additional anchorage facilities. He regards as the most practicable plan of improvement the provision of a dredged anchorage area at the entrance to

Lobster Cove, in accordance with Plan "B". The Federal Government, it is concluded, is warranted in adopting the improvement involved in Plan "B", provided local interests will contribute one-third of the first cost of the project, but not in excess of $25,000.

41. Recommendation. - The district engineer recommends that the existing project for Annisquam River, Massachusetts, be modified to provide for a dredged anchorage area at the entrance to Lobster Cove, 8 feet deep at mean low water, extending from the 8-foot depth in Annisquam River to a point about 1,000 feet below the wooden bridge at the head of the dredged portion of Lobster Cove, as shown in Plan "B" on accompanying map, at an estimated cost of $69,300 for new work, and $2,200 annually for maintenance, in addition to the latest approved estimate for maintenance of Annisquam River. Adoption of this improvement by the Federal Government should be contingent on assurances satisfactory to the Secretary of War and the Chief of Engineers that local interests will assume responsibility for the following conditions of local cooperation:

a. Contribute one-third of the cost of the Federal improvement, but not to exceed $25,000.

b. Provide, without cost to the United States, suitable areas for the disposal of dredged material.

c. Hold and save the United States free from all claims for damages attributable to the work of improvement.

42. The work should be prosecuted at a rate sufficient to insure its completion within one year, and the necessary funds should be provided in a single appropriation.

L B Gallagher

L. B. Gallagher
Major, Corps of Engineers
District Engineer

Inclosures:
Map
Plate

BOSTON DISTRICT

Gloucester Hbr. 1/21.11 Subject: Survey (Review of Reports) of Gloucester Harbor and Annisquam River, Mass.

1st Ind.

Office, Division Engineer, NORTH ATLANTIC DIVISION, New York City, August 15, 1940. - To the Chief of Engineers, U. S. Army.

I concur with the views and recommendation of the District Engineer.

J. N. HODGES,
Colonel, Corps of Engineers,
Division Engineer.

Incls.:

* 1/21.11a and b (2 tracings);
1/21.11c, in dupl., each with list (15 additional) (without list.)
* 12 copies of District Engineer's Report (Nos. 3 to 14, inclusive)

* under separate cover.

WAR DEPARTMENT.

CORPS OF ENGINEERS, U. S. ARMY.

PLATE OF GLOUCESTER HARBOR AND ANNISQUAM RIVER, MASSACHUSETTS.

NOTE

COASTWISE RECEIPTS:-REFINED PETROLEUM PRODUCTS 7387 TONS.
IN ADDITION, CARGOES OF FRESH FISH WERE TRANSPORTED ON THE RIVER BETWEEN IPSWICH BAY AND GLOUCESTER HARBOR, BUT TONNAGE IS NOT OF RECORD.
5376 BRIDGE OPENINGS WERE REQUIRED FOR VESSEL PASSAGE. IT IS ESTIMATED THAT AS MANY MORE PASS THROUGH REQUIRING NO OPENING OF THE DRAW. THE ABOVE IS FOR THE YEAR 1939.

LEGEND

(127) STATE ROUTE NUMBER

2 SHIP CHANNEL MILES

VICINITY MAP
SCALE OF MILES
10 0 10 20 30 40

SCALE OF FEET
1000 0 1000 5000 10000 FT.

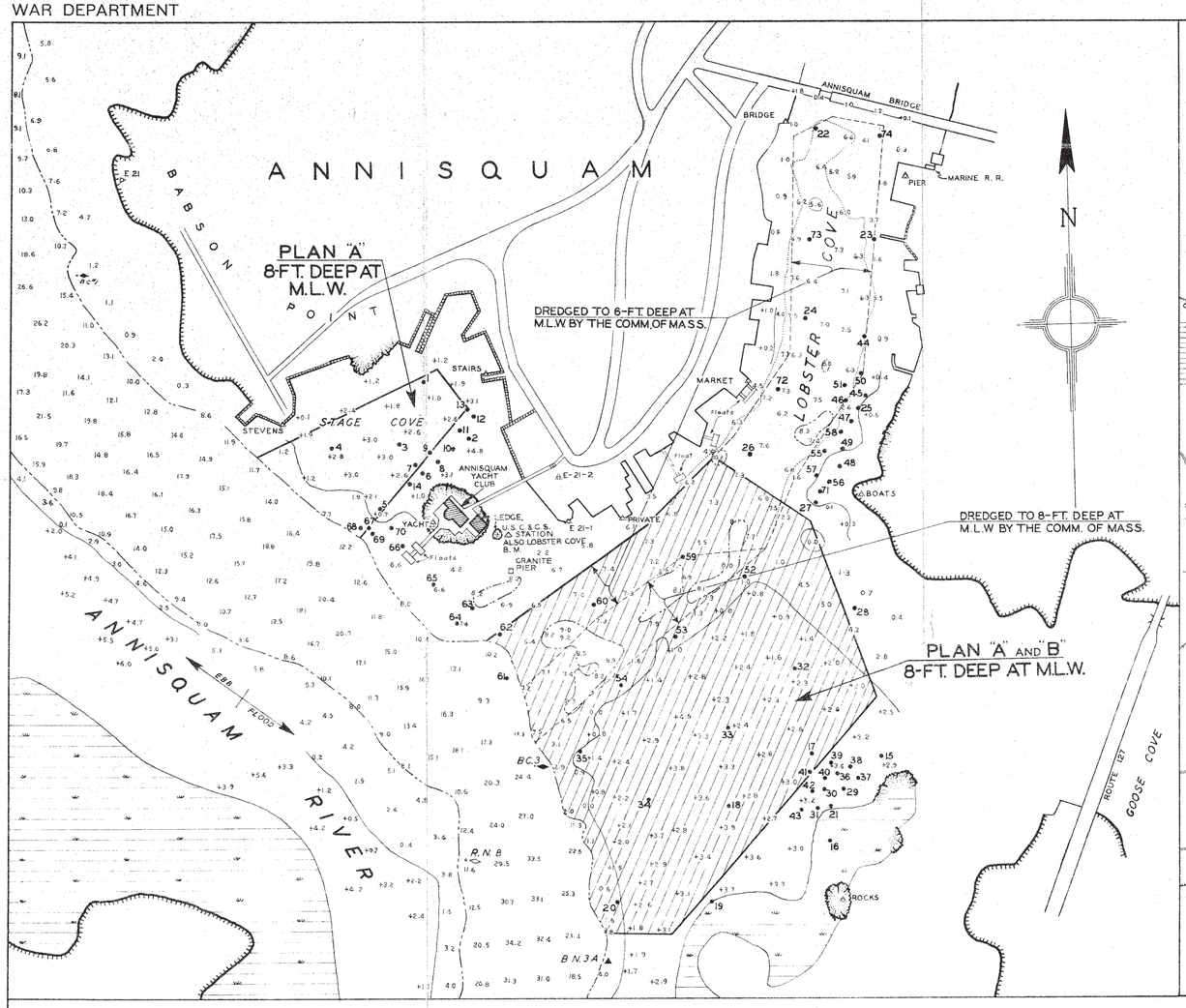
U.S. ENGINEER OFFICE, BOSTON, MASS, JULY 31, 1940
SUBMITTED: APPROVAL RECOMMENDED: APPROVED:
MALCOFF MALCOFF MALCOFF
DIST. ENG.

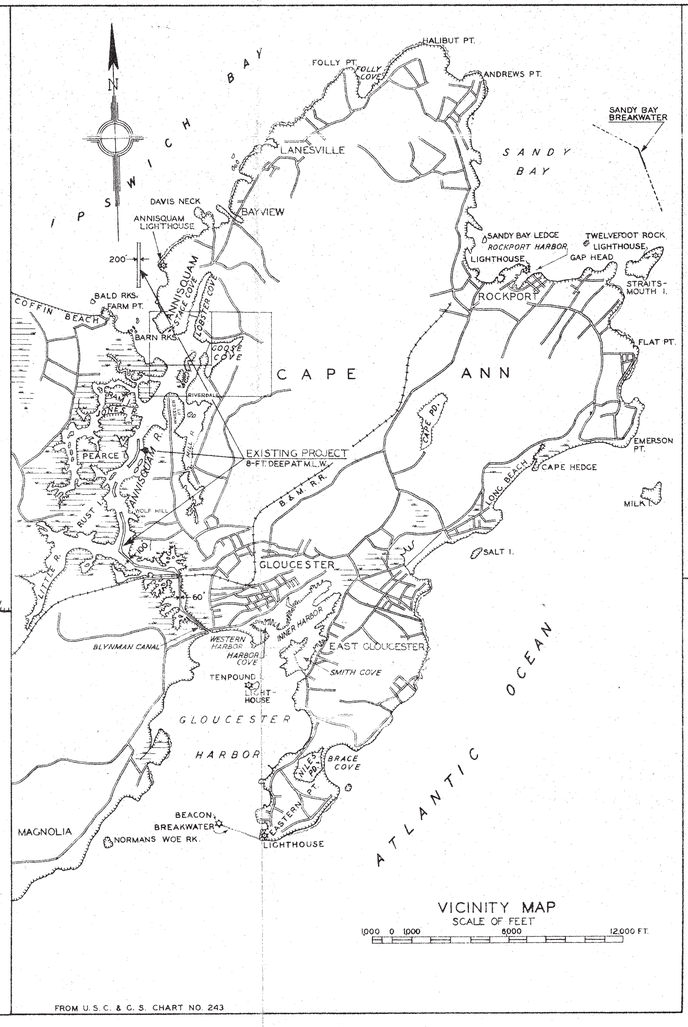
TRANSMITTED WITH REPORT DATED AUGUST 5, 1940.

FILE NO. 187 DR. 37

WAR DEPARTMENT

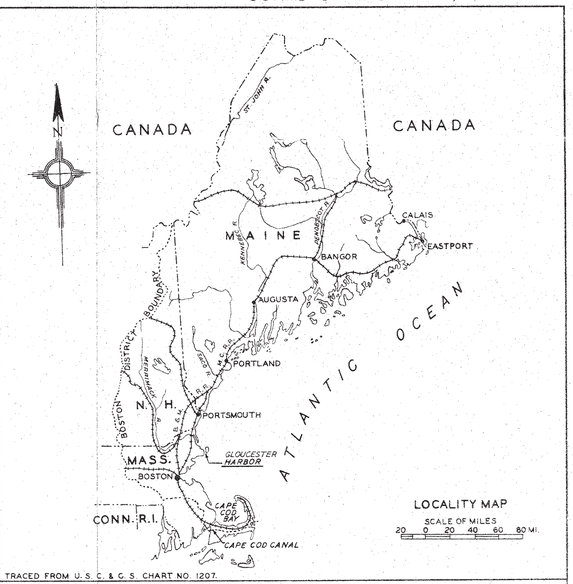
CORPS OF ENGINEERS, U. S. ARMY





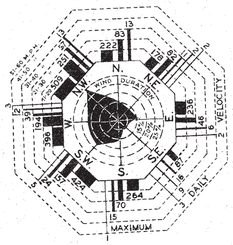
VICINITY MAP
SCALE OF FEET
1000 0 1000 6000 12,000 FT.

FROM U.S.C. & G.S. CHART NO. 243

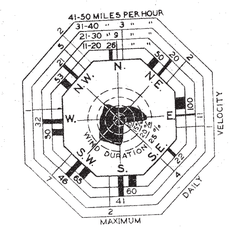


TRACED FROM U. S. C. & G. S. CHART NO. 1207.

WIND DIAGRAM FOR BOSTON HARBOR, MASS.
1927—1937



WIND DIAGRAM FOR BOSTON HARBOR, MASS.
FOR JUNE, JULY & AUGUST 1933 TO 1939 INCLUSIVE.



DATA FROM OBSERVATIONS BY THE U. S. WEATHER BUREAU AT BOSTON STATION, BOSTON, MASS.

TABLE OF PROBINGS

NO. OF PROBING	DEPTH IN FEET WATER	PROBING	PENETRATION	CHARACTER OF MATERIAL
1	+1.1	11.2	12.3	MUD, LITTLE SAND.
2	+3.0	7.3	10.3	MUD, LITTLE SAND, LEDGE.
3	+2.7	10.1	12.8	MUD TO SOFT SAND.
4	+2.6	11.4	14.0	SAND TO MUD AND SOFT SAND.
5	+1.2	10.8	12.0	SAND TO MUD, LITTLE SAND
6	+2.5	6.5	9.0	MUD AND SAND, LEDGE.
7	+2.6	10.4	13.0	MUD AND SAND.
8	+3.0	7.7	10.7	MUD, LITTLE SAND, LEDGE.
9	+2.6	10.5	13.1	MUD, SAND AND MUD.
10	+2.6	10.2	12.8	MUD, LITTLE SAND TO COARSE SAND, LEDGE.
11	+2.8	10.4	13.2	MUDDY SAND.
12	+3.2	5.4	8.6	MUD, LEDGE.
13	+2.8	10.0	12.8	MUD TO MUDDY SAND.
14	+3.1	10.0	13.1	MUD, LITTLE SAND, LEDGE.
15	+3.0	10.4	13.4	MUD, SANDY CLAY.
16	+5.4	5.7	11.1	MUD, SAND, GRAVEL, LEDGE.
17	+3.2	11.0	14.2	FIRM SAND, SOFT SAND AND CLAY.
18	+2.9	10.1	13.0	MUD, FIRM SAND, SOFT SAND AND CLAY, HARD SAND OR CLAY.
19	+4.5	10.0	14.5	SOFT MUD, SAND AND CLAY, FIRM SAND AND CLAY.
20	+0.5	11.6	12.1	SAND, SOFT SAND.
21	+6.0	+6.0	0.0	LEDGE. (OUTCROP OR BOULDER.)
22	6.4	12.9	6.5	MUD AND SOFT SAND AND FIRM SAND.
23	5.5	12.0	6.5	MUD, SOFT SAND, GRAVEL, LEDGE.
24	6.2	15.0	8.8	SOFT MUD AND CLAY.
25	0.0	5.1	5.1	MUD, ROCK.
26	7.0	12.1	5.1	SOFT MUD AND CLAY, GRAVEL.
27	+0.2	10.4	10.6	MUDDY SAND.
28	2.0	12.9	10.9	" "
29	+2.2	4.2	6.4	SAND, GRAVEL, LEDGE.
30	+2.2	10.0	12.2	SAND, LEDGE.
31	+2.5	4.1	6.6	" "
32	+1.1	12.1	13.2	SAND.
33	+2.2	11.2	13.4	"
34	+2.2	10.7	12.9	"
35	0.5	12.7	12.2	"
36	+2.3	4.3	6.6	SAND, GRAVEL, LEDGE.
37	+2.3	8.1	10.4	" " "
38	+2.4	10.8	13.2	SAND, GRAVEL.
39	+2.6	10.0	12.6	SAND, GRAVEL, LEDGE.
40	+2.5	9.3	11.8	" " "
41	+2.8	11.0	13.8	SOFT SAND.
42	+2.8	10.6	13.4	SAND.
43	+2.7	10.7	13.4	SOFT SAND.
44	6.9	14.0	7.1	" "
45	0.0	7.5	7.5	SAND, LEDGE.
46	3.3	11.1	7.8	SOFT SAND AND CLAY.
47	2.0	9.3	7.3	SOFT SAND, LITTLE GRAVEL, LEDGE.
48	+0.1	5.4	5.5	MUD, LEDGE.
49	+1.5	9.9	11.4	MUD, GRAVEL, LEDGE.
50	3.2	13.3	10.1	MUD, MUDDY SAND.
51	6.5	11.5	5.0	MUDDY SAND.
52	2.8	13.1	10.3	SAND.
53	+1.2	13.4	14.6	"
54	+0.2	12.2	12.4	"
55	+1.1	11.3	12.4	MUD TO SANDY MUD.
56	+0.3	7.2	7.5	MUD, LEDGE.
57	+0.6	11.2	11.8	MUD TO SANDY MUD.
58	5.5	11.3	5.8	SOFT MUDDY SAND.
59	7.1	12.6	5.5	SOFT SANDY CLAY.
60	6.8	13.4	6.6	" " "
61	7.0	12.0	5.0	SAND.
62	6.5	12.0	5.5	"
63	7.5	10.9	3.4	"
64	7.0	7.7	0.7	SAND, LEDGE.
65	7.7	8.0	0.3	" "
66	5.5	8.2	2.7	" "
67	3.2	9.1	5.9	" "
68	5.4	10.8	5.4	SAND.
69	4.2	10.2	6.0	SAND, GRAVEL, LEDGE.
70	1.5	10.6	9.1	SAND.
71	0.0	10.4	10.4	MUD TO MUDDY SAND.
72	7.6	14.4	6.8	MUD, SAND, GRAVEL.
73	7.4	12.2	4.8	SOFT MUD, LITTLE SAND.
74	4.2	11.4	7.2	MUD.

NOTE

SURVEYED BY E.A.MONIER, JR. ENGINEER, FROM FEBRUARY 17, TO MARCH 30, 1940.

DEPTHS ARE EXPRESSED IN FEET AND TENTHS AND ARE REFERRED TO THE PLANE OF MEAN LOW WATER AS INDICATED BY THE BENCH MARK.

BENCH MARK:—A STANDARD U.S.C.&G.SURVEY DISC. ELEVATION 9.41 FEET ABOVE MEAN LOW WATER.

MEAN RANGE OF TIDE IS 8.5 FEET.

LEGEND

HIGH WATER LINE,

MEAN LOW WATER LINE,

LEDGE ABOVE MEAN LOW WATER LINE,

8-FT. CURVE OF DEPTH,

ELEVATION ABOVE MEAN LOW WATER, +2.7

DEPTH BELOW MEAN LOW WATER, 5.3

LOCATION OF PROBING WITH NUMBER, 12

6-FT. CURVE OF DEPTH,

RECOMMENDED IMPROVEMENT (PLAN B) SHOWN THUS

GLOUCESTER HARBOR AND ANNISQUAM RIVER, MASSACHUSETTS.

IN 1 SHEET SCALE 1:2000

100 0 100 200 300 400 500 600 700 800 FT.

U. S. ENGINEER OFFICE, BOSTON, MASS., JULY 31, 1940.

SUBMITTED: E. Sullivan, MAJOR, CORPS OF ENGINEERS

APPROVED: E.B. Gallagher, MAJOR, CORPS OF ENGINEERS, DISTRICT ENGINEER

APPROVAL RECOMMENDED: MAJOR, CORPS OF ENGINEERS

TO ACCOMPANY REPORT DATED AUGUST 5, 1940.

CHIEF, RIVERS AND HARBORS DIV. SR. ENGINEER

DFS. BY J.M.T. CH. BY J.M.T. CK. BY A.J.K.

FILE NO. 178. DR. 37